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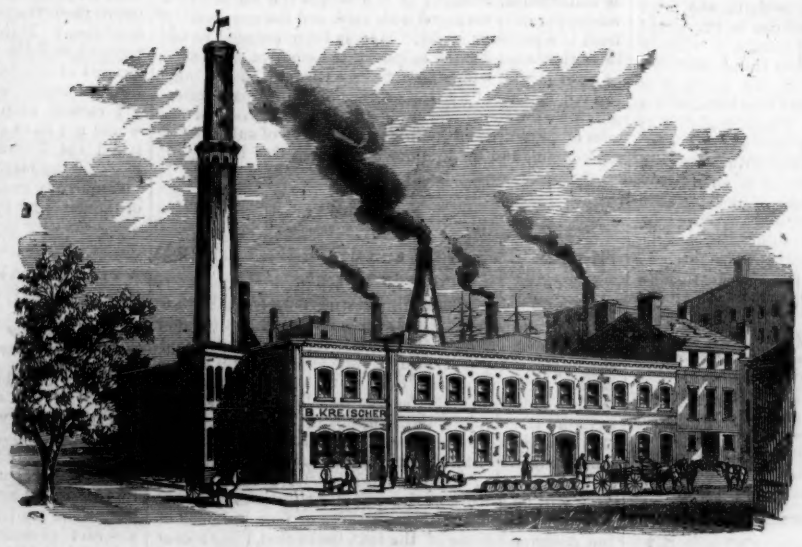
B. Kreisher & Son.
New York and Staten Island Fire-Brick and Clay Retort Works,

58 Goerck Street (Cor. Delancy), N. Y.

The excellent illustration herewith, gives a correct idea of the New York Works and office at 58 Goerck street (corner Delancy), New York. These works are built of the materials made at the Staten Island Works—cream colored fire-brick—and the entire structure is neat, unique, and artistic in finish, and tasteful in its architecture. This house was established in 1845.

The success of this house in their branch of manufacture has been marked and satisfactory. Considerable difficulties had been experienced about 1854 in procuring a reliable supply of clay, and the proprietors feeling the necessity of having their own mines, purchased the clay property (discovered by B. Kreischer) situated at Westfield, Richmond county, Staten Island, and there erected extensive works for the manufacture of fire-brick and clay.

The clay here prepared was transported to the New York Works by means of a propeller built expressly for that purpose. Large additions were made to these premises in 1855, and such was the growth and prosperity of this little village, by reason of Mr. Kreischer's enterprise and success, that a post-office was established, and the place named Kreischerville.



FIRE BRICK AND CLAY RETORT WORKS.

In 1865, valuable clay beds, at Woodbridge, N. J., and Chester county, Pa., were purchased, and the business had become so prosperous that the New York manufactory was rebuilt, and a new system of burning and drying, together with improvements in machinery, etc., were introduced.

In 1867, large works were also built in the city of Philadelphia by B. Kreischer, W. A. Loughridge, and George Ellis, to extend the business of manufacturing fire-brick, drain-tiles, and clay retorts.

For a period of more than a quarter of a century B. Kreischer has given close study and personal supervision to this important branch of manufacture. The European systems have regularly been examined by him, and valuable improvements have, from time to time, been made. Such untiring energy, industry, and perseverance, have met with the deserved reward of gaining the highest reputation for his goods, wherever they have been used.

In 1869 large extensions were made at Staten Island Works; eight kilns for retorts, seven retort shops 300 feet by 80 feet were added, and they now have the largest and best facilities for turning out good work, and with despatch. They are supplying most of the large gas companies in the country.

The Remarkable Gas Wells at Erie, Pa.

The Erie *Republican* says that drilling has been suspended in the gas well of Stearns, Clark & Co., and the work of tubing and seed-bagging were accomplished. Everything being in readiness fires were kindled beneath the boiler, and soon the flames roared and leaped from one end of the furnace to the other. It was found by actual measurement that after sufficient gas had been used to generate the requisite amount of steam there still existed a pressure from the well equal to about 100 lbs. to the square inch. Before the match was applied to the pipes the whole pressure was tested by means of a steam gage, and was found to be about 200 lbs. to the square inch. Of course the stars and stripes were run up on the flagstaff which overtops the derrick as soon as the result was known to be a certainty. It is now believed by the proprietors of Presque Isle Iron Works, that that institution has as good a well as any yet struck in the city. The hole is six inches in diameter and descends into the earth 542 feet.

Two hundred pounds pressure to the square inch is equivalent to thirteen atmospheres.

A correspondent writing from Erie, Pa., adds the following:

Our gas wells are still going down with success. We have about a dozen completed, and half as many more are being bored.

Every one so far have struck heavy veins of gas.

Private parties are now boring to get fuel and light for their dwellings.

Since the above was in type we glean the following from the New York *Herald* of the 28th ult.:

Erie, Pa., Oct. 27.—This city was lighted last night and to-night by natural gas, obtained by the Erie Gas Company from a well sunk near their works. Thirteen gas wells are now in successful operation in various parts of the city. The gas is found at an average depth of 550 feet, and the average yield per well per day is upward of 20,000 cubic feet. It requires no purifying, and is being rapidly introduced into private houses. Thus far, every well put down has proved a success.

Fort Scott Gas Well—Its Utility as an Illuminator.

REPORT OF SUPERINTENDENT FARWELL.

Mr. Farwell, superintendent of the gas works of this city, has just returned from Fort Scott, and reports his investigations of the value of the "gas well" at that place, as far more satisfactory to the owner of the well and the citizens of Fort Scott than he had any reason to expect before his late visit to that place.

His tests and experiments were made at different times during the day, and with the following results: There is an unceasing flow of gas from the well, at an average rate of seven cubic feet per minute, or a daily yield of 10,080 cubic feet, a quantity amply sufficient to supply the present city of Fort Scott with their gas for illuminating, and some to spare. The gas is of good illuminating power, and the flow from the well is of sufficient pressure to operate a gas-holder, which would be necessary to confine and store the gas before distribution.

The well has been discharging this gas for about on

year, and if all that has gone to waste in this way had been utilized and sold, the owners would have received a revenue of about $16,500, which would be the actual value of the gas lost during the past year.

This well is on the farm of Mr. John G Stewart, about a mile and a half south west of the city. It was discovered while boring for coal. No coal was reached at a depth of 260 feet, and the project was abandoned The gas has ever since continued to discharge itself from the four-inch tube, but has never been applied to any use except the lighting of the building which has been erected over the well. This building is used as a residence by the parties who exhibit the "burning well," and is fitted up with gas pipes and fixtures, and the gas is used by them for illumination.

When lighted at the opening of the well, a volume of fire about two feet in diameter rushes up to the height of about twelve feet, presenting a beautiful effect. By building a gas holder and laying the necessary pipes for distribution, there would be no difficulty in furnishing a good quality of illuminating gas to the citizens of Fort Scott for lighting their business and dwelling houses, and to the city for lighting the streets.

Mr. Stewart is one of a company of gentlemen who hold a franchise for lighting the city of Fort Scott, and will now investigate the cost of lighting from the "gas well." Should the time soon come when the city would require more gas than the well will discharge, the company could then build a small gas works adjoining the well, and, by working the two together, could make large dividends, even by selling gas at a very low figure.

The "gas well" is a fortune in itself, and should be utilized.—*Kansas Republican.*

How to Work Steam Boilers Without Making Smoke.

As many of our readers are the owners of steam boilers, and have experienced difficulty in working them so as to avoid a smoky stack, we are glad to be able to supply the following observations on the subject from an undoubted authority: "Smoke cannot be consumed when once made, but it can be prevented by properly proportioned fire-grates, with due admission of air and careful firing, and without the need of expensive or patent apparatus. The subject may be clearly explained by a simple illustration. Petroline or naphtha and such like compounds form the most smoky fuel, yet for a few pence lamps can be purchased which are familiar to all, which consume it without the least trace of smoke. The most simple cottager knows that his lamp need never smoke unless it is turned up too high. It smokes in that case because it is then worked beyond its power. Immediately it is turned lower, the lamp gives better light at a less cost, and without waste. It is just the same with boiler and other fire grates. When they smoke it shows they are overworked. Lessen the quantity of fuel burnt in each grate to the proper proportion, and keep the supply of fuel regular, and the smoke will cease, and the greatest economy will be received. A bright and smokeless flame as well indicates that a large furnace is doing its proper and highest duty, as the bright flame shows the lamp to be in order. It is well that public bodies should insist on smoke being prevented as much as possible, but mischief and dissatisfaction result if the only way to satisfy complaint is by adopting some of the special apparatus. The true way to prevent smoke is to have sufficient boiler room to generate the steam required sufficiently slowly to allow the combustian to be complete. There is greater economy in this than in futile efforts to force too small a boiler to do the required work with ruinous waste."—*Ironmonger.*

Chemical Repertory.--No. 41.

NOVEMBER 2, 1870.

Editor—HENRY WURTZ.

Editorial.

[Below are the comments on Professor SILLIMAN's Abstract in our last issue, for which we could not then make room.—H. W.]

The now celebrated *Sulphur Report*, for the excellent digest of which we are indebted to the pen of Professor SILLIMAN, was duly transmitted to the undersigned, by favor of the Gas Referees, on its first issue in July. We at first contemplated publishing it in full, notwithstanding its bulk; but learning from Prof. S. that he was engaged on an abstract, it was thought best to await this, especially as such a multitude of matters of the highest interest to gas men crowd at present upon our far too limited space. (Those who desire to read the original in full, will find it in the *London Journal of Gas-Lighting* of August 16, 1870, page 619–23.) We add some of the comments of our London contemporary, expressing the astonishment and incredulity with which these developments have been met. Indeed, some of the asserted results involve so much of paradox, and even of apparently impenetrable mystery, that the referees cannot reasonably expect either gas engineers or gas chemists (particularly the latter) to give them absolute credit until a rational explanation for them has been arrived at, which, we suspect, will only follow from the application of that very "Laboratory Chemistry" which they seem to decry, and to the general *absence* of which, in Gas Works hitherto, we deem "these tears" to be due. We would call attention particularly, to the finding of more sulphur after scrubbing than before. In a discussion upon a paper of Mr. LIVESEY on scrubbers, read to the British Association of Gas Managers June 8 (at which date it appears that these conclusions of the referees had already been noised abroad) Mr. UPWARD suggested that the increase of sulphur came from the *coke* used in the scrubbers, and that if Mr. LIVESEY's plan of scrubber, filled with boards, were used, "this difficulty would be removed" From their report, it appears, however, that the referees *have used* Mr. L.'s scrubber. If the facts are to be regarded as established therefore, our only conclusion must be that the increase of the sulphur was *from the ammoniacal liquor* used in the scrubbing, and that sulphur compounds exist in the crude gas which are first condensed with the liquor, but which, by time or prolonged contact, are so modified as to be again taken up by the gas. This would attach great importance to plans of purification of the ammoniacal liquor before use in scrubbing, like that proposed by Mr. HILLS of Deptford (see the REPERTORY of October 3, 1870, p. 98), and by many others before him. The how and why of all this, nevertheless, remains to be determined, and *laboratory investigation* only, as aforesaid, can determine it.

As to the suggestion made of the spontaneous engendering of sulphuretted hydrogen or sulphide of ammonium in gas, *after purification*, by metamorphoses of the unknown sulphur compounds left in the gas, the undersigned would recall attention to a former suggestion of his own, to precisely the same effect, which will be found in this REPERTORY of June 2, 1870, page 162, as follows:

"The editor has noticed within his experience, more than one instance in which gas as delivered to consumers tinged lead paper strongly, and was complained of as maladorous, whereas at the Works the purification was apparently managed with care, and the gas directly from the purifiers sweet. He has been induced to believe that some of the sulphuretted compounds known to exist in gas, which do not tinge the test paper and are not taken out by iron or even by lime, may undergo afterwards *spontaneous* decomposition, with formation of sulphuretted hydrogen or rather of sulphide of ammonium, and he does not now resign this belief."

H. WURTZ.

American Chemical News.

THE DISCUSSION ON FLAME-TEMPERATURES.

By Professor WALLING.

[The following highly interesting note from Professor WALLING was received at too late an hour to admit of proper comment in this issue. Without having had any opportunity therefore of sufficiently careful examination, I can at present but say that it appears necessary, in order to solve the doubts which seem still to environ the subject, in the minds of both Prof. WALLING and myself, reference will be necessary to the original memoirs of FAVRE and SILBERMAN in the *Annales de Chimie et de Physique*, and a careful study thereof. This will be a work of time, as these articles are very voluminous, and run through three or four volumes of the *Annales*. None of the text books that I have consulted give sufficient details to be of any use.—H. W.]

LAFAYETTE COLLEGE, Oct. 15, 1870.

Professor HENRY WURTZ.

Dear Sir: Seeing in your editorial of the 2d ultimo, "On the Calorific Power of Hare's Blowpipe," an allusion to the conversation we had on the subject last year, when I suggested an alteration in your formula, I would like to state my reason for making the suggestion.

Not being very familiar with the investigations of FAVRE and SILBERMANN, I was in some doubt as to whether the 34462 thermal units, as determined by them, measured the actual thermo-dynamic effect produced by the combustion of one unit of hydrogen, or whether this determination was obtained by causing the combined gases, after combustion, to melt ice until their temperature was reduced to 0° Centigrade, and then measuring the heating power by the quantity thus melted. Assuming, as it seems so to be generally understood, that the latter is the truth, I thought, and have not changed my opinion, that your formula for the flame temperature should allow for the specific heat of water in the first 100°, as well as for the latent heat of the steam produced.

In the numerator or quotient of the formula we have the number of thermal units, which are effective in producing the flame temperature, and we have only to divide this quantity by the number of units of the resulting steam, multiplied of course by their specific heat.

If we reverse the process of FAVRE and SILBERMANN, we shall expend 9×100 thermal units in heating nine units of water at zero to the boiling point, and 9×537 more to convert the water into steam, after which the remaining thermal units will heat the steam to the flame temperature; hence the formula should be

$$\frac{34462 - 9\,(537 + 100)}{9 \times .4805} + 100$$

which is easily reduced to the formula given by Dr. WATTS or myself.

There is, however, a condition of the problem alluded to in your editorial, which it becomes necessary to take into account in exact computations, namely, the initial temperatures of the gases. That is, if we start with the oxygen and hydrogen at some temperature above zero, say t, we shall have an amount of thermal energy to augment the flame temperature, over and above that produced when the gases are ignited at zero, equal, in thermal units, to the number of degrees of initial temperature, multiplied by the number of units of gas into their specific heat; thus—

$$t\,(1 \times 3.409 + 8 \times 0.2175)$$

or

$$9\,t\,(0.5721)$$

and the formula becomes

$$\frac{34462 - 9\,(537 + 51.95) + 9\,t\,(0.5721)}{9\,(.4805)}$$

Before quitting the subject, however, I would like to ask for information, and to remove the doubt originally expressed to you, whether it is certain that FAVRE and SILBERMANN did not deduct from the ice-melting effect of the hydrogen flame, the amount which would be developed by the latent heat of the steam, and the excess of specific heat of the water after condensation. At any rate ought they not to have done so, to determine the actual thermal energy developed by the combustion of hydrogen? Is there any reason to believe that there is any direct production of water *in the liquid condition* by the combustion? Is not the product of the combination of the two gases a compound gas, which differs from its components, by being nearer to its liquifying point than they are, but not by being in a different condition? If this be so, FAVRE and SILBERMANN had no right to include in their determination that surplus amount of interior work which would be required to heat the liquid water, and change its condition.

I cannot help feeling that a principle so obvious would not have escaped these eminent philosophers. If it did not, BUNSEN's calculation would be correct, and likewise the last formula given by you on page 66, if you multiply instead of dividing the initial temperature of the gases by 0.5721. Yours truly,

H. F. WALLING.

PRELIMINARY NOTE ON THE CHEMICAL GEOGONY OF SILICA.

Read to the New York Lyceum of Natural History; by Prof. HENRY WURTZ, *October 10th*, 1870.

Prof. WURTZ began by stating that the present introduction of this subject, with regard to his own plans and intentions, was quite premature; but that he was in a measure obliged to come forward, though in a preliminary and somewhat unsatisfactory way, by the manner of reception of some hints recently thrown out by himself, of some of his peculiar views on the subject. The reader of this REPERTORY will recollect an abstract presented to them (issue of Sept. 2, 1870, p. 67) of recent papers on the organo-chemical relations of silica. In the *Journal of Applied Chemistry*, Prof. JOY has taken up the subject in the following highly appreciative way:

"Prof. Henry Wurtz, in a recent number of the *Gas-Light Journal*, thus remarks upon the extraordinary discovery of Friedel and Thenard: 'We have demonstrated thus, at once, a theory not only of new relations of plant decay to plant nutrition, but also of the far broader subject, of the transformations and migrations of silica throughout all past geological ages, and of the continual and (as the writer has long believed) *sole* agency of *life* in these, as in the past and present migrations and transformations of carbon. More of this, though, in another place.'"

"The importance of researches of this character in agriculture, geology and mineralogy cannot be exaggerated, and it is impossible to anticipate what must be their effect upon the hitherto accepted theories in these branches of science. The organic origin of the diamond has long been suspected, but the particular manner in which it found its way into the rocks has been the occasion of considerable speculation. That we shoul

look to the same life source for the occurrence of silica has not been suspected by many writers, but we now have the idea distinctly announced by Prof. Wurtz, than whom we have no higher scientific authority in the country. The ancient miners believed that minerals grew just like plants, and certain metals were called unripe ores because they were useless, and if they were left undisturbed a few centuries longer the pure metal would arrive at maturity. * * *
If we really have a solvent for silica and carbon, we may look to the artificial crystallization of quartz and the diamond as of possible consummation within no distant period—but the manufacture of these gems is of insignificant importance as compared with the possible bearing of the discovery upon the growth of crops and the enriching of our soil."

Professor Joy then quotes from KOLBE, as follows:

"The student of mineralogical chemistry must now rest content with a mere quantitative analysis, or with the empirical deduction of rational formulæ from the results of such analysis. Such a process can never fully elucidate the chemical constitution of inorganic compounds. This can only be accomplished by a careful and systematic study of the decompositions, syntheses and substitutions; in other words, by the application of methods of research similar to those which have yielded such splendid results in organic chemistry."

Prof. W. considered it necessary therefore that he should at once put some of his ideas on record, preparatory to future exposition of the experimental researches which he has long had in progress. As long ago as 1854, he took occasion, in the report upon the Geology of New Jersey for that year, page 37, to insist on the importance of silica in soils in the soluble form, thus:

"It is the ingredient in soils which furnishes to many plants, especially to the cereals, such as corn, wheat, etc., the *silica*, which is absolutely necessary to the formation of their stalk or stem. Silica, which is the most abundant of all mineral substances, forming certainly more than one half of the mass of the earth, so far as the latter is known, occurs in soils in three different forms; first, in the crystalline form as quartz sand, etc., in which form it is wholly insoluble, and may be considered inert, so far as the nutrition of plants is concerned; secondly, in combination, in fragments of feldspar, hornblende, and other silicates, in which it is also comparatively inactive; and thirdly, as amorphous or *soluble* silica, or *opal*, as it is called by mineralogists, the only form of much importance in agriculture, since in this form it is soluble in the liquids of the soil. Far too little attention has been paid in analyses of soils and fertilizing minerals to their content of opal or soluble silica, whereas a soil may be rich in every other necessary ingredient, and yet, if deficient in this respect, be perfectly sterile for many crops.

"An analysis of the straw of wheat, made by Weber, in the laboratory, and according to the method of H. Rose, showed 3.82 per cent of total ash and, in this, 68 per cent of soluble silica. A ton of such straw must therefore obtain from the soil not less than 50 lbs. of silica."

The importance of the function of soluble and hydrated forms of silica in mineral fertilizers, like green sand, has been underrated. Though some vegetable spongioles *may* be able to cause quartz to pass into solution in the sap, yet it is of course the soluble forms that are thus chiefly taken up, constituting the vegetable skeleton, as phosphate of lime the animal. Silicic acid, though so minute an ingredient in actual animal nutrition is indirectly as essential to animal life as even carbonic acid. The author has presented to the Lyceum and to the American Association, peculiar views of the relations of oxygen and carbon to life, arrived at by the *a posteriori* method of studying the chemical changes now going on, and tracing them backwards throughout their anterior stages (see this REPERTORY Nos. 18, 20, 21, 22, and 23). By the application of the same process to the past history of silicic acid, equally curious generalizations regarding the relations of this material (which next to oxygen is the most abundant of all) to zoic history in the past and the present, are pointed to with greater or less probability. This study is, however, as yet far more difficult and uncertain than in the case of carbonic acid, for the reason that the facts as yet established by chemical research regarding the habitudes and migrations of silicic acid, and the parts which it sustains in the grand drama of Life, are comparatively few. The pervading idea has been that this acid was pre-eminently the mineral acid, and that its study belonged therefore to mineralogy, a science in itself so great and complex that it has as yet scarcely advanced beyond the first stage, namely that of provisional classification.

Prof. WURTZ believes, however, that his studies have unmistakably tended towards the conclusion, which will be startling to many, that silicic acid, *as such*, that is in isolated forms, *appertains in origin at least, altogether to the vegetable kingdom*, and that the tendency of chemical investigation and discovery is to confirm this conclusion. He presented, to illustrate this and other related generalizations, the following diagram, which was prepared in substance nearly a year since, and of course before the announcement of the discovery by PAUL THENARD of the nitrohumic solvents of silicic acid. This discovery serves now to illustrate the agencies concerned in the second stage of migration, in the diagram, that which involves the transfer, by condensing atmospheric waters, of the soluble silica of soils, of the external continental *cuticles* (so to speak) to the fluviatile systems of drainage. As illustrations of the general neglect that the whole subject has received from chemists hitherto, it may be mentioned that almost the only analyses of the waters of first class river systems, in which the amount of soluble silica present has been determined separately, are those of STERRY HUNT. In his analysis of the waters of one of the great rivers of the world, the St. Lawrence, he found the relative properties of carbonates of lime and and silica to be, in 10,000 parts 0.8083 and 0.37; or as 100 to 45.77. A comparison of this result with others recently published by JOHN HUNTER, of Atlantic deep-sea ooze, from 14,600 feet deep (*See Am. Chemist* for October, 1870, p. 138) is instructive. HUNTER found for the relative proportions of carbonate of lime and silica in this 100 to 39.10; and this notwithstanding that we have scarce an analysis of oceanic water indicating silica as a constituent.

Prof. WURTZ finds also that an analysis made by himself very carefully of the waters of the Delaware River collected just above tide water at Trenton in 1856 (See *Am. Jour.* of Science xxii, 154) gave the proportions, when all the lime was calculated as carbonate, of 100 of the latter to 31·7 of silica. Doubtless the great difference in the geological surfaces of drainage systems of the St. Lawrence and Delaware will serve to explain the variation from HUNT's results.

Geogonic Migrations of Silica Throughout the Kingdoms of Life.

PRODUCTS.	WORKING FORCES. ("ENERGIES.")	RULING OR DIRECTING INFLUENCES. ("LAWS.")	MATERIALS.		ALPHA—THE PROZOIC ERA.	
Silicated Plant-Tissues.	Heat.	The Zoic Dawn. Plant-Life and Solvent Influences of Water and Carb. Acid.	Igneous (?) Silicates of the Continental Nuclei	Water. Carbonic Acid. Ammonia (?)		
Soluble Silica or Silicates. Silica of Animal Skeletons.	Heat.	Animal-Life and Solvent Influences of Water and Carbonic Acid.	Silicated Plant-Tissue.		First Stage.	THE ZOIC ERA.
Soluble Silica of Animal Excretions. Silica of Animal Skeletons.	Heat—Gravitation.	Animal Life—Solvent Influences of Water and Carb. Acid, and Thenard's compounds?	Soluble Amorphous and Hydrated Silica and Silicates of Soils. Decaying Plant—Tissues, (Humic and Ulmic Substances) Silicated Springs—Water and Carbonic Acid.		Second Stage.	
Dissolved Fluviatile Silica. Infusorial Silica—Dissolved Oceanic Silica—"Gaize" etc.	Heat—Gravitation.	Animal and Plant Life of Oceanic Waters (Diatoms, Sponges, etc). Chemical Affinities.	Dissolved Oceanic Silica (Held in solution by Ammonia?)		Third Stage.	
Silica Compounds of Oceanic Sediments—Hydrates of Silica (of Diatoms, etc). Glauconites—Some Serpentine (?) etc., etc.	Heat—Gravitation.				Fourth, or Metamorphic Stage.	METAZOIC ERA.
Opaline Silica, and Siliceous Rocks: Flints, Hornstones, Jaspers, Agates, Chalcedonies, Siliceous Schists, etc. Tridymite—Wernerite, etc. Hydrated Mineral Silicates. Quartz and Crystalline Silicates of Metamorphic Schists, and Metamorphic Traps, etc., etc. OMEGA.						

The sulphur springs near Michigan City, Ind., are to be fitted up in first-class style by a company, who propose to make a fashionable summer resort out of them.

Photometry as Applied to the Estimation of the Value of Coal Gas.

By Messrs. T. N. KIRKHAM, C. E., and W. SUGG, A. I. C. E.

[The following lecture was delivered at the meeting of the British Association of Gas Managers, held recently.]

Deeply sensible as we are of the honor you have done us in asking us to deliver the customary evening lecture, yet, finding it no easy task to fulfil, we are induced to ask your kind consideration for us in our efforts to place before you all that is known up to the present time of a science peculiarly interesting to managers, viz., that of photometry, as applied to the purposes of gas lighting. In his first lecture, at Manchester, in 1864, Dr. Letheby gave a short description of his photometer, as fixed at Jewry street, City: and Mr. Barlow, on May 24, 1866, read a paper to you upon the registering jet photometer.

This is all the information you have had officially placed before you upon this most important subject, and it is the intention of my colleague and myself in this lecture to give you a condensed epitome of all that has been done in this branch of philosophic science since the commencement of gas lighting up to the present time, so that you may be in a position to realize the entire question, and be in a position to judge for yourselves what is best to be done in order to obtain that desideratum—an uniform standard of measurement of the illuminating power of coal gases. The want of this standard is felt more and more as the science of gas lighting advances. In the early days of gas lighting, it was sufficient for the gas manager to know how much gas could be produced from a ton of coal, and the cost of production. Gradually, however, it has dawned upon the minds of municipal authorities and consumers generally that something more than mere quantity is required in the supply of gas. Quality and purity have become, if not household, at least "parliamentary words," and it is now usual, whenever companies are before Parliament for increase of capital, or further powers of any kind, for the municipal authorities to put on the screw in their best possible manner to obtain an extra candle or two in the illuminating power proposed by the company, as well as a reduction in price, and thus obtain a double advantage. And even if there is no opposition such as this, yet the gas manager, in making his report of the working of the establishment under his charge, must state not only the quantity of gas he can produce, but also the illuminating power of that gas, in order that his work may contrast favorably with that of *confrére* in other establishments. In addition to all this, we have in the city of London and the Dublin Gas Acts a new phase in gas legislation, which may be taken as a precedent in prospective cases, and imperatively commands our attention to the subject of how the illuminating value of gas is to be determined; for it is proposed to exact heavy penalties in every case in which the company fails to supply gas not up to the standard fixed in their Act.

Already questions have arisen upon this subject, and it is for us to examine it well, and be prepared to state what is a just and reasonable mode of examining the quality of the gas, so that both buyer and seller may be mutually satisfied.

At the outset, the science of photometry, as applied to gas, divides itself between two systems. The one by which it is sought to measure the illuminating power of a gas by means of some property peculiar to itself; the other, by which the amount of light produced from the gas under examination is compared with some other artificial light.

The first mentioned section includes within its limits such photometers as the

Lowe's jet photometer.

The various duration tests, Dr. Fyfe's, or others.

Erdmann's "Gas-Prover."

Chambeyron's photometer (see "Clegg," 1859 edition, page 363).

And the second section those of—

Wheatstone, Bunsen, Letheby, Ritchie, Arago;

Church and Mann;

Rumford, Foucault, and Evans.

As this lecture is not intended to be a history of photometry, but rather an explanation of what it is, and how it applies to the manufacture and distribution of gas, we shall not deal with the subject in the chronological order of the invention of the various photometers, but as it ranges itself under the two heads mentioned above.

First, then, the simplest, viz., that system which proposes to measure the illuminating value of the gas, not by comparison with other artificial lights, but by certain physical phenomena peculiar to each quality of gas.

One of the most admired of these was certainly the bromine test, because it seemed that a chemical experiment which could always be performed in the same manner, and with instruments made upon one model, must necessarily give true results, being quite independent of faults of vision or irregularities in the working of apparatus. The principle upon which the system

is founded is common to other systems, and is this: "The gas which will give the highest illuminating power is that which contains the most carbon." To find the quantity of carbon in the gas is then the object of the bromine test.

Bromine is a metalloid, and at ordinary temperatures is of a deep brownish red color. It is liquid, and boils at 113 deg. F. Its specific gravity is 2·97. Its vapor resembles that of nitric acid, but has a peculiarly disagreeable pungent smell. It is poisonous, and acts so strongly on the lining membrane of the nose, that smelling a bottle of bromine is often followed by painful irritation of the nostrils, attended with a copious flow of tears lasting for hours or even for days. Such is the description of bromine. The method of performing the experiment is as follows:

A Cooper's tube is filled with gas, and a small quantity of bromine is introduced, and the whole shaken up together. Any excess of bromine is neutralized by the introduction, after condensation has taken place, of a little caustic potash. The amount of condensation is greater or less according as the gas contains more or less carbon. The value of the degrees of condensation having been once definitely settled, it would appear to be only necessary to perform this apparently simple experiment to determine without doubt the value of the gas under examination.

Its advocates, however, have reluctantly been compelled to abandon it, because, although it absorbs hydrocarbon vapors, so it does other things as well, and its indications are therefore now considered to be valueless. It may be mentioned that the vapor of bromine is not an agreeable thing for operators at all careful about their throat or lungs. If it had been a successful system, the science of photometry might have had its martyrs as well as others.

Lowe's Jet Photometer might, perhaps, have taken its place first, if the subject were considered in the chronological order of the invention of the instruments of photometry, because it seems that several persons claim to have made use of such an instrument many years ago, at the very commencement of gas lighting, *if not even before it.* They appear to be much annoyed that the name of George Lowe should be given to this instrument any more than the name of any of those who are said to have used it very long before he did. If there is any wrong done to any one in the naming of this instrument, it is for your humble servant to cry *peccavi.* Although the principle upon which it was constructed may have been discovered by other persons, it was nevertheless he who made it of any practical value; and it is indebted to my colleague and myself for those improvements upon Lowe's instrument which have placed it in the position it now occupies in the estimation of gas managers. I trust you will not impute to us any idea of unduly praising ourselves, but it is advisable to clear up as we go on, so as to prevent misapprehensions in future.

The principle upon which it works is exactly the same as that of the bromine test, viz., that the richest gas contains the most carbon; to this is added the words, "and requires the greatest quantity of oxygen for its combustion."

It will be seen that this principle is applied to another instrument which operates in a different manner to arrive at a solution of the question: viz., Erdmann's gas-prover, which will be explained in its proper order.

Lowe's theory is substantially this: A jet of gas issuing from an orifice of fixed dimensions under a constant pressure, and requiring a certain amount of oxygen for its proper combustion, must necessarily, if the gas contains a greater quantity of carbon per cubic foot, produce a longer flame than that which contains a lesser quantity, because it must go higher to come in contact with that oxygen. Thus the richer the gas the higher the flame.

Now, in order that every quality of gas may be estimated under the same circumstances, Mr. Kirkham and myself have found it more convenient to substitute for his theory this, which amounts to the same thing in the end, viz., maintaining a 7-inch flame from an orifice of certain fixed dimensions, the illuminating power of gas is in direct proportion inversely as the pressure.

To explain this popularly, we refer you to the diagram of the jet photometer arranged for the use of these instruments. By inspection it will be seen that it is ruled off in lateral and longitudinal lines: the former corresponds to the illuminating power of the gas in candles, the latter to the pressure required to give a 7-inch flame. This is the height of flame which we have adopted as standard for gases of from 9·6 to 22 parliamentary sperm candles, six to the pound, burning at the rate of 120 grains per hour. Thus, then, it will be seen that at ·63 pressure, 14-candle gas with our standard jet gives a flame of 7 inches in height; that 12-candle gas requires ·685 pressure to give the same height of flame; that 16-candle gas gives the standard flame at ·575 pressure; that 20-candle gas gives the standard flame at ·465 pressure, and so on for all other qualities of gas within the range previously stated.

So that to ascertain at once by simple inspection the exact illuminating power of any gas to be examined by the aid of this instrument, it is only necessary to adjust the height of the flame to 7 inches, note the pressure required, consult the diagram, and read off the answer in sperm candles without further calculation. Now, you will naturally say, "Yes; this is all very well, but what proof can you give to substantiate your theory?" Before answering this question, it is necessary to premise that this theory, like many others, was not thought out first and afterwards proved by experiments, but that, on the contrary, the theory was constructed upon the tabulated results of experiments conducted for another purpose. We might even say, if you will pardon the simile, that our object was to convert the indications of the Lowe's jet into sperm candles and carcel lamps; but, like the Zulu Kaffirs did in the case of a celebrated calculating hierarch of the Church of England sent over for their benefit, Lowe's jet converted us. Thus its correctness claims our assent to the fullest extent to which truth can be demonstrated by induction.

[To be continued.]

Practical Management of Gas Works.

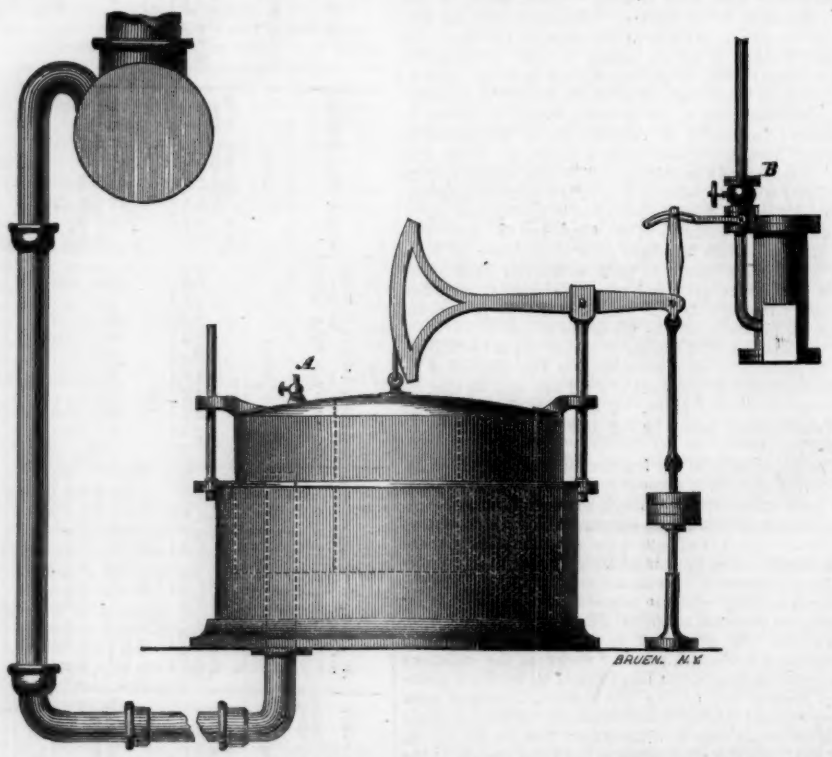
By James R. Smedberg.

[Written expressly for this Journal]

NUMBER XI.

Accompanying this article is given a cut of the Beggs Exhaust Governor, the theory and performance of which I proceed to explain.

Gas-makers who have used the exhauster prior to erecting a compensator must have noticed the great waste of work due to the latter. They must have



observed, in other words, that their exhauster required greater speed, and their boiler more fuel with, than without, the compensator. This was remarkably the case at the Howard Street Works, San Francisco, where an exceedingly handsome specimen of Sabbaton's Piston Compensator was erected about two years ago, and worked with all possible care.

The function of the Compensator is purely precautionary against air-contamination, and operates only to pass an excess of gas, instead of a volume of air, into the inlet of an overspeeded exhauster. Now to be on the safe side, the ports must always be slightly open, and it thus throws upon the exhauster the needless work of pumping what gas rushes back through these slight openings under a pressure of from 6 to 12 inches of water. This waste is constant.

But again: the compensator, by the most absurd logic, accomodates work to power, instead of power to work, as shown; and so far from being an automatic instrument, requires adjustment as the velocity of the gas varies. The same compensator requires more counter-weight when the velocity is 500 than when it is 400 lineal feet per minute, from the fact that it is only connected with the hydraulic main by a long pipe, *through which gas is passing,* and in which, consequently, the back-pressure developed by friction varies as a function of velocity—D'Harcourt says, as the *cube* of the velocity. These two vices of positive waste and negative inefficiency, utterly damn any compensating instrument which *passes* gas; and no such instrument can be advantageously used to regulate steam-supply, especially if placed at any distance from the hydraulic main, Clegg, Anderson and the rest to the contrary notwithstanding.

The great features of Mr. Beggs' really beautiful instrument are

1st. A transfer-pipe for communicating the pressure or vacuum of the hydraulic main to the annulus of drum.

2nd, A pressure-register drum whose rise and fall actuates the steam-throttle.

There you have the whole thing in a nut-shell.

The drum is floated so as to give, in the King Street example 6 inches rise or fall for every 1 inch of difference of pressure. The drum is 60 inches in diameter —the central float $\sqrt{\frac{60^2}{7}} = 22.68$ inches diameter, thus giving the float one sixth the area of the annulus. The transfer-pipe is 4 inch. The annulus as well as the float is covered in at bottom, with the exception of a circular hole 5¼ in. diameter to take the rising portion of the transfer pipe and one or two other small openings. These are all under the annulus, and their function is to compel a *gradual* influx and efflux of water, and thus destroy any tendency to oscillation. The drum is so counterweighted as to float half in, and half out of water, with a cock connected with the top of the annulus open, the range of the instrument being from 2 inches vacuum to 2 inches pressure. Outside these limits the main steam valve does the work.

At King Street, an ordinary butterfly valve is used for the throttle, although it would be better to employ a conical plug, and thus secure greater sensitiveness and accuracy of opening. Having thus explained the construction of this exhaust-governor, let us now look at its mode of action.

The drum being counter-weighted, as above, to equilibrium, the valve on the transfer pipe is opened, and the statistical condition of annulus instantly becomes identical with that of the hydraulic main. If there be an inch pressure in the latter, the drum instantly

rises 6 inches, and opens the throttle wider, until the engine speeds up the exhauster, bringing the pressure on the hydraulic main to O. The drum simultaneously settles to the normal water line, and varies from it *only through very small distances and in very small times*, as benches are opened or charged. The exhauster is not called upon to do more than its proper work; and after the arm of the throttle is once adjusted, the pressure of the hydraulic main acts by means of the governor to secure a corresponding speed to the exhauster, and we so have a thoroughly automatic combination, and work our coal under as great uniformity of pressure as can be imagined or desired.

I remember well, in 1853 and 1854, that dip-pipes were allowed 3 inches seal, instead of ½-inch as with us occidentals; and from some papers recently laid before me, am inclined to think that some of the small New England Works still labor under the heavy back pressure due to a deep seal.

With light seals, the bug-bear of carbon so nearly disappears, that a clay retort requires scurfing only twice or thrice in its life-time, and the waste of illuminating matter is proportionately lessened.

I am about to make some experiments with the view of determining the effect of *complete* removal of the dip-pipe seal. There will be some gain: *how much*, remains to be seen. Any mode of closure would do for this purpose tolerably well; but my experiments will be made with the Chapman valve, which the manufactures adapt very nicely to this special purpose. One thing is certain: that each retort must be controllable separately by a valve or equivalent device, and for reasons too obvious to demand mention. I may here digress to say, that the Chapman valve appears very valuable as a stop for steam, water, or gas, from its features of cheapness, lightness, efficiency, and ease of repair.

A very simple form of exhauster by-pass is a canvass door, swinging at top on a hinge rod, the seat laying over at top at a small angle from the perpendicular. The door opens toward the exhauster outlet. The frame is of light iron, say 2 by ⅛, and to it a couple of thicknesses of canvass well coated with red-lead, are stoutly attached. At Howard street I adopted an exterior arrangement for relieving the gas flow from the weight of door, in case the exhauster-belt breaks or the engine stops.

Having previously spoken of the merits of the Mackenzie Exhauster, nothing remains to be said on this subject except to advise, in the strongest terms, a small independent engine for exhausting purposes. Even the boiler feed should be accomplished by a separate steam pump; and all machinery, pumps, brick-mills etc., should be actuated by a larger engine entirely disconnected from the small one, whose work, night or day, is unceasing. That the exhauster *may* run unceasingly, it is advisable to have its boiler and engine in duplicate. It makes the gas company's nine dollars, ten, and therefore should never stop.

In experimental works, the exhauster is represented by a gas holder say 16 by 8 ft., suspended from three points by light wire ropes, carried home to a hollow counterbalance of suitable size. By wholly or partially flooding this last with water, any desired amount of relief may be secured to the retorts.

Smedberg's "Synopsis of British Gas-Lghting."

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Letter from Italy—Remedy for the Freezing of Gas Pipes.

PIACENZA, ITALY, October 8, 1870.

Messrs. Editors: In your valuable paper of the 16th September, I read the letter headed "Freezing of Gas Pipes." Having been myself in such a case as the one treated by your subscriber, I hope a few hints about the way I managed, may be useful to him.

The creek I had to cross with the main was 50 feet wide; the main itself was four inches in diameter, and was to be fixed along the bridge by any suitable contrivance. I had the main made of sheet iron, and well bituminized, the coating being of about one inch thick; the tubes were fixed at their place with strong iron hooks; an old rope was twisted around the main, and well tarred, making an envelope against cold. At each end of the bridge there was a dry valve, and near to each valve, but between them was left a hole, a small chain being inside the main, each end of which could easily be caught from the holes made at the extremities; but when the gas is in the main, of course the holes are shut up. But if the gas becomes obstructed the valves must be shut; the holes are opened, and by aid of the chains a picce of rag is made to run once or twice inside the main, the whole length of the bridge.

In the town where this main was laid the temperature was about 10 deg. Centigrade below freezing point in winter. The chain is used very rarely; but it is there to help the cleaning of the tube in a ready way,

in case the envelope would not be sufficient to prevent freezing. If the weather was very cold, I think it would be better to put the main into a box full of charcoal powder.

Respectfully yours,
A. DE LACHOMETTE, Engineer.

[The above correspondence, written by a very prominent and experienced gas engineer of Piacenza, Italy, where such remarkable political changes are occurring. It will be read with interest by all gas men on this side of the water, and especially those who are troubled with the freezing of mains. It seems even "sunny Italy" has a pretty low temperature at certain periods of the year.—EDS.]

On Multitubular Condenser.

NEWARK, October 14, 1870.

Messrs. Editors: I have read Mr. Smedberg's article on the Multitubular Condenser, in your last issue. I have taken Peclet's formula, as stated in D'Hurcourt (page 273):

In air $Q = 8\ (1 + 0.0066\ t)\ t$

In water $Q = 43\ (1 + 0.105\ t)\ t$

and find that D'Hurcourt's table is correct for an excess of 10 deg. or 20 deg., but wrong for an excess of 30 deg, 40 deg., or 50 deg., while the table, as given by Hughes and Clegg is wrong for an excess of 10 deg. and 20 deg., but correct for an excess of 30 deg., 40 deg., and 50 deg. The table should be:

Excess of temperature in the Gas.	Quantity of heat lost by a Square unit of exterior pipe surface.	
	In Air.	In Water.
For an excess of 10 deg.....	85.2	881.5
" " " 20 "	181.1	2.666.0
" " " 30 "	287.5	5.35305
" " " 40 "	404.5	8.944.0
" " " 50 " ...	532.0	13.437.5

Yours very truly, X.

Report of Inspector of Illuminating Gas.

We have received the following report from W. A. Aiken, inspector of illuminating gas for the city of Baltimore, for the quarter ending October 1, 1870. The average of the observations on the illuminating power chemical purity, and pressure of the gas supplied by the Baltimore Gas-Light Company during the past quarter was as follows:

MONTHS.	Illuminating power in candles.	Pressure in main maximum.	Pressure in main minimum.	Burn'g pressure during trial of gas.	Maximum illuminating power.	Minimum illuminating power.	Temp. of room.
July.....	16.4	3.6	2.0	.2	17.5	14	78.2
Aug.....	16.3	3.7	2.3	.2	17	14	80.
Sept.....	16	3.8	2.6	.2	17	14	74.5
Average..	16.2	3.7	2.3		17.1	14	77.5

The inspector remarks that the quality of the gas during the past quarter has been satisfactory in regard to chemical purity. Its average illuminating power has been a trifle lower than during the corresponding quarter of last year, though steadily above the standard

Recent American Patents.

Pertaining to the Specialties of this Journal, for the two weeks ending October 8, 1870.

107,723.—Steam Engine.—W. F. Richardson, Pittsburgh, Pa.

107,743.—Gas Carbonizing Attachment for Street and other Lights.—Samuel Whitney, Newark, N. J.

107,746.—Automatic Cut-off for Steam Engine.—D. A. Woodbury, Rochester, N. Y.

107,748.—Steam Engine Condenser.—Harrison Anderson, Peoria, Ill.

107,789.—Water Wheel.—Dennis Lane, Montpelier, Vt.

107,805.—Water Wheel.—Ezra Parker, Beverly, Ohio.

107,809.—Manufacture of Illuminating Gas.—E. A. Pond, G. H. Pond, and M. S. Richardson, Rutland, Vt. Antedated September 24, 1870.

107,816.—Vapor Generating Burner for Stoves.—D. E. Ryan, St. Louis, Mo.

107,824.—Shield for Gas Burners.—Ira W. Shaler, Brooklyn, N. Y.

107,838.—Water Pipe.—John F. Ward, Jersey City, New Jersey.

107,840.—Steam Generator.—Wm. Weston, Wm. R. Weston, N. R. Weston, and Burt Brett, Stevens' Point, Ill.

107,848.—Manufacture of Illuminating Gas.—William Young, Magdalen Bridge, and Peter Brash, Leith, Scotland. Patented in England, April 6, 1870.

RECENT ENGLISH PATENTS.

[From the LONDON ARTISAN, Oct. 1, 1870.]

2344—Gas Lamps—F. Gray.
2350—Stopping the flow of Gas—T. Lacey and C. S. Lacey.
2352—Construction of Hydrometers—J. T. Linford.
2354—Inflammable Gas—T. Clayton and W. H. Bailey.
2383—Steam and Gas Engines—I. Baggs.
2411—Pressure Guage and Alarm Apparatus—G. Haseltine.
2426—Gas Burners—C. W. Moaley.
2437—Gas and Air Engines—G. H. Ellis.
2472—Measuring the Flow of Water—T. Onion.
2506—Water Guage—E. Kidd and G. Bourne.
2516—Purification of Water—G. Bischof.
2517—Filtering—H. Harris.
2521—Gas Burners—A. H. Brandon.
2528—Cut-off Valve Gear for Steam Engine—D. H. Brandon.
2554—Steam, Air and Gas—W. Firth.
2570—Drain Pipes—H. J. Jones.

Applications made by Americans for British Patents during the week ending Oct. 7th, 1870, reported by our Agents in London for the AMERICAN GAS LIGHT JOURNAL.

2596—Valve apparatus—Meissner, Ackerman & Co., New York, dated 30th September.
2602—Signals and signalling—J. Gordon, San Francisco, Cal., dated 30th September.
2608—Motive power engines—T. T. Prosser, Chicago, Ill., dated October 1st.
2611—Ammunition for fire arms—T. J. Powers, N. Y., dated Oct. 1st.
2615—Polishing machine—P. F. Randolph, A. K. Van Horne, and H. V. Voorhees Ill., dated Oct. 1st.
2628—Machine for tapping metallic nuts—B. Howland Paola, Kansas, and E. Fitch, Ravenna, O., dated 3d Oct.
2633—Lifting and force pumps—J. H. Gustin, Middletown, Ind., dated October 4th.
2634—Chamber utensil—V. Rhodes, Memphis, Tenn., dated Oct. 4th.
2636—Carpets—G. Crompton, Worcester, Mass., dated Oct 4th.
2642—Galvanic batteries—E. D. McCracken, H. J. Newton, H. B. Kirkland, and J. R. Husson, N. Y., dated Oct 5th.
2647—Heels for boots and shoes—J. Read, Philadelphia Pa., dated Oct. 6th.
2652—Weighing scales—J. V. Mathivet, Cleaveland, O., dated Oct. 6th.

Profs. Hall, Harkness, and Eastman, of the Naval Observatory, according to a despatch in the *Times*, will sail from this city on Wednesday next. Their destination is the island of Sicily, where they go to observe the solar eclipse.

Prof. R. Ogden Doremus will deliver four lectures on the "Triumphs of Modern Science," at the hall of the Young Men's Christian Association, on the evenings of December 1, 8, 15, and 19. The attractive character of the subject, and the character of the lecturer, will be sure to fill the hall on each occasion.

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BRITISH GAS LIGHTING.

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This work will comprise the essence of the London *Journal of Gas-Lighting*, from February 10, 1849, to December 31, 1867, and afford a succient resume of the entire English Gas Engineering between these dates.

The excerpts will, as far as possible be symmetrically arranged under the heads of Coals, Distillation, Purification, Volumetry and Photometry.

It is to be executed by JAMES R. SMEDBERG, Engineer San Francisco Gas-Light Company. Subscriptions should be addressed to the offices of the AMERICAN GAS-LIGHT JOURNAL, 42 Pine st Room 18, New York.

It will be issued only to subscribers.

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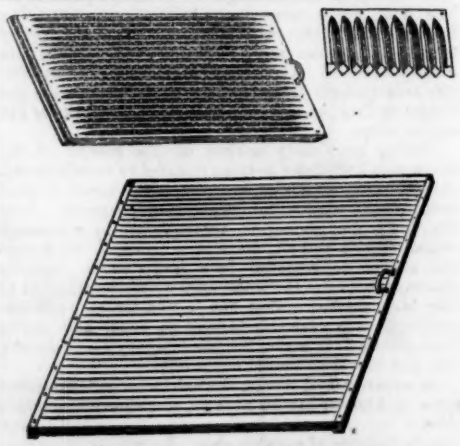

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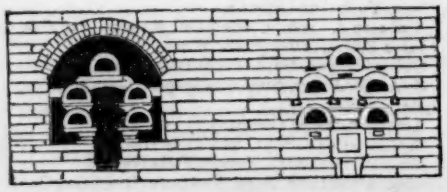

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EDITORS AND PROPRIETORS.

Consulting Chemist,
Geologist and General Scientist,
PROFESSOR HENRY WURTZ.

[NOTE BY PROFESSOR WURTZ.—Contributions and items for which I am, as a Scientist, individually responsible, will have attached my full name or initials.—H. W.]

WEDNESDAY, NOVEMBER 2, 1870.

WISHING TO MAKE this Journal an organ of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, the publishers solicit letters from all among them who make the study of those subjects a pleasure, or a profession.

Subscribers would confer a favor upon us by remitting *CHECKS* or *POST OFFICE MONEY ORDERS*, as we are frequent losers where money is enclosed in letters.

☞ NEWS AGENCY.—The American News Company, 119 and 121 Nassau street, New York, are agents for this Journal. Newsdealers will please send orders to them.

NOTICE.

☞ *All Collections for Advertisements, Subscriptions, etc., are made directly from this Office. We have Agents to solicit the same, but they are not authorized to Receipt for Money.*

TO OUR SUBSCRIBERS AND PATRONS.

In making remittances for subscriptions, always procure a draft on New York, or a POST OFFICE MONEY ORDER, if possible. Where neither of these can be procured, send the money, but always in a REGISTERED LETTER. The registration fee has been reduced to fifteen cents, and the registration system has been found by the postal authorities to be virtually an absolute protection against losses by mail. ALL Postmasters are obliged to register letters whenever requested to do so.

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PATENTS.

M. L. CALLENDER & CO., Proprietors of the AMERICAN GAS-LIGHT JOURNAL, AND CHEMICAL REPERTORY offer their services to inventors as Solicitors of

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GENERAL EDITORIAL.

OBITUARY.

JOSEPH A SABBATON.

Since our last issue the inexorable vault has closed upon one whose place will not be readily supplied. When we assert that he who has gone from among us in the flower of his age and usefulness, was one of "Nature's Noblemen," we scarce indulge in metaphor. For the facts put brifly here on record regarding the professional career of Mr. SABBATON, we are indebted chifly to a near relative of the deceased.

It was clearly in the order of nature that he came by his high qualities. It is not yet a year since we had to record the departure of one from whom he must have inherited many of these. We allude to his father, the late PAUL. A. SABBATON, Engineer and Superintendent of the Albany Gas-Light Co.

Mr. JOSEPH A. SABBATON was born in New York, October 1st, 1825. After receiving a liberal education, he was associated with his father in various mechanical operations, as an assistant—such as iron works, forges, etc., until about 1857. Subsequently he was engaged in superintending the erection of several small gas works, but in 1849 was appointed Engineer of the Albany Gas-Light Company. He resigned that position in 1851 to superintend the erection of the Gas Works at Washington, D. C., after which he was engaged as a Contractor with others in erecting several gas works in various places. About 1855 he was appointed Chief Engineer of the Manhattan Gas-Light Company, which position he held until the time of his death. He had a very fine taste for literature, and his mind was well stored by extensive readings in poetry the classics, and history.

We feel it necessary to the satisfaction of our own earnest feelings in this onse, and hope that it may be a melancholy satisfaction to the multitude of his personal friends (enemies he could scarce have had), to add some statements founded on our own personal knowledge. Mr. JOSEPH A. SABBATON was an exceptional man. He was one whose learning and disposition were strikingly superior; and the genialty and cordiality exercised by him towards all, together with his profound professional attainments, and wide general intelligence, formed a rare combination of qualities. His counsel and advice were much sought after, and always promptly and freely accorded, and usually in such a way as to produce the deepest convicition of power and authority.

Apart from all personal considerations, a vacancy is left here which will not soon be filled.

FAIR OF THE AMERICAN INSTITUTE.

Whoever visits the Fair of the American Institute, now being held in this city at the Great Rink 63d street, between 3d and 4th avenues, cannot fail to be impressed with the wonderful advances we are making in the Arts, Sciences, and Agriculture, etc. Nothing, perhaps, is more striking than the display in the mechanical department. Here the evidences of the remarkable versatality of the inventive genius of the country and the age, are too apparent to fail to awaken the interest of the most unobservant spectator.

We propose to refer to some of the more prominent inventions and improvements which will be interesting to the readers of this Journal. To attempt a full and impartial description, would require more than the entire space in this Journal.

STEAM ENGINES, PUMPS, ETC.

STARKEY'S STEAM ENGINE.—This engine does not claim any new principle, but the perfect application of "old and fixed laws" to a new and simple movement. The steam cylinder is securely bolted to a plain bed plate, through both ends of which the piston rod passes—slides being dispensed with. Mounted on the main cylinder, at a right angle, is a smaller cylinder, in which are the steam ports, with an ordinary valve, which is a section of a circle. The valve is operated by an arm so connected with one of the side rods of the piston, that the rapid rising and falling motion of the crank, when passing the centres, opens the ports quickly, and keeping them open when at half stroke, so that the full power of the steam is obtained. These engines occupy little room, and are light and simple in construction, and are especially adapted for use in factories, machine shops, mines, for hoisting machinery, etc.

STARKEY'S PATENT CENTRIFUGAL PUMP.—This is one form of pumps which act on the principle of a rotary air-blast blower, and consists of a circular casing or shell enclosing rapidly rotating blades or wings. The ports of entrance and exit are on either side, on a line with its axis. A fixed partition is at right angles to the axis of the pump, and divides the chamber into two equal parts, one only containing the rotating blades. The water passes in at the centre of one side, and is driven by the rotating blades to the periphery, where it passes over the the outer edge of the partition and is deflected to the axis or center where it is discharged.

This pump is admirably adapted to raise large bodies of water. Having no valves to wear or become obstructed, it is adapted for ships, wrecking, mines, tanners, etc. The pump on exhibition, though small, raises a volume of water, that falls into a tank with the rush and splurge of a young cataract.

Wm. Taylor & Sons, Columbian Iron Works, Nos. 25 to 39 Adams street, Brooklyn, have the above described engine and pump on exhibition.

GREEN'S UPRIGHT BALANCE ENGINE.—This engine has claimed for it compactness, strength, durability, and simplicity. It is an inverted beam engine. It avoids jar, owing to the adaptation of the working beam with the piston and crank, and their connections, which *balance* each other. The piston rod, valve stem, beam centre, and all the connection pins are made of steel. The exhaust-belt covers the entire length of steam cylinder, giving freedom to the exhaust, and acts as a casing to retain heat, and prevent condensation.

GREEN'S IMPROVED FEED PUMP.—This is a simple plunger pump, mounted on the out board pillar block, and is driven by grooved frictional gearing. The plunger is adjusted to short or long stroke, and can be worked by hand whenever desirable. These pumps are supplied with Green's Check and Stop Valves, to avoid being injured by frost.

The engine and pumps above described, are exhibited by Messrs. Green, Trowbridge & Baldwin, 326 to 328 Delancey street, N. Y.

WRIGHT'S IMPROVED BUCKET PLUNGER STEAM PUMP.—This is a vertical steam pump, composed of the parts of a simple slide valve and eccentric steam engine, attached in a novel and compact manner to a bucket and plunger pump, that discharges water at both strokes of the piston. The water valves are either metal or rubber, and placed so access may be had to them by the simple removal of one bolt, and without disturbing any of the pipes. This is claimed to be a compact, efficient, and cheap-priced fly-wheel pump, made in sizes to discharge from two gallons to two hundred gallons per minute. This pump is exhibited by the Valley Machine Co., Easthampton, Mass.

THE WOODWARD STEAM PUMP.—This well known

pump is on exhibition in great variety. The advantages of this pump briefly, are durability of all wearing parts, especially the valves, which are swing valves and made of metal; freedom from jar or noise, and ease with which the valves can be got at and replaced. These pumps are of excellent workmanship, and adapted to all kinds of work. Exhibited by the Woodward Steam Pump Manufacturing Co., Nos. 76, 78, and 80 Centre st., N. Y.

NIAGARA STEAM PUMP.—The leading features of this pump are, the simple and ready method of removing the valves, which is done by unscrewing a single nut. The valves may be made of metal, rubber, or even wood, and can be renewed in case of necessity by any one who can saw a piece of board. Several sizes of these pumps are exhibited by Chas. B. Hardick, No. 23 Adams street, Brooklyn.

INCOMBUSTIBLE JACKETING FOR BOILERS, ETC.—Several varieties of jacketing are on exhibition, the most noteworthy, perhaps, being called the "Sabbaton Jacketing." This is a new conducting material, which resembles somewhat gutta-percha, in which has been mixed a quantity of coarse fibrous matter. It is made in sheets of any required size and thickness, and is said to be very superior for protecting boilers, steam pipes, and the like.

The inventor is Frederick A. Sabbaton of Troy, New York.

PLASTIC JACKETING.—Different varieties of this material were on exhibition. It is made up like a mortar and put on in a similar manner to plastering, forming a continuous covering of any required thickness. It resembles a mixture of peat, or clay and earth, and fibrous material, similar to hair. It is claimed to be easily applied, non-combustible, a non-conductor of heat, and of low cost.

PYROGRAPHY.—This is a new art invented in England, and consists, as the name indicates, in printing by fire through a system of metallic cylinders, which burns into the wood any design required, which is indestructible. From its nominal cost and great beauty, it seems likely to take the place of much of the expensive ornamentation and inlaid work now done by hand. The samples on exhibition are panels of wood, printed with very beautiful and ornamental designs, in great variety; for car and carriage manufacturers, architects, builders, carpenters, cabinet makers, etc., this art must be very useful.

The Fair will close on the 5th inst. The attendance has been large, and the financial success of the fair is said to be greater than any of the thirty-eight which have preceeded it. During the week there will be skating on the artificial lake, and a promenade concert every evening.

THE JOURNAL OF APPLIED CHEMISTRY

One of the most encouraging auguries for the future, to those who read "the signs of the times" is furnished by the consideration of the quantity and quality of the labor which is now being expended, especially in America, to popularize Science; that is, to convey to the public *genuine* Science, in language sufficiently divested of technicalities, and imbued somewhat with the cunning of rhetoric, so as to make it attractive to a very large class, the great mass of readers in fact, whose propensity is irresistible to "skip over" all the hard words. The time was and that not long since, when the scientist who undertook this task lost caste, being accused of seeking after notoriety, and of degrading science by reducing it to the comprehension of the herd; a sentiment which is fast passing into the category of the relics of monkery. In fact, we may now very appropriately apply to those who object to the clothing of Science in such garb as to render it pleasant, instead of repugnant, to the uninitiated, the reply of old MARTIN LUTHER, to those who made the like demur to his innovations in Church Psalmody, that he "did'nt see why the devil should have all the good music."

These ideas have been suggested to us by looking over a file of the above Journal for the current year, which we have just obtained. This Journal is fortunate, among other advantages, in having among its constant contributors a gentleman who ranks first among the pioneers in this task of introducing scientific topics to the American public; namely Prof. CHARLES A. JOY, of Columbia College. Each issue during this year has had one, sometimes several, practical treatises from the pen of this accomplished writer; which in style of diction and in adaptation to the purpose intended, could not be surpassed. Among the subjects thus treated may be mentioned Coal Tar, Waste Products, Glucose, Extract of Meat, Soluble Glass, Chemistry of Food and Wine, etc., etc. There is also a multitude of most interesting editorials, many of which we judge must be from the same masterly source. Besides valuable original matter from other pens, the Journal of Applied Chemistry is among the most highly appreciated of our exchanges; in view of the mass of practical information it contains, relating to the markets for drugs and chemicals; new Scientific Publications and so on. We should like to appropriate largely and constantly from this Journal, but that we are more and more embarassed by the increasing accumulation of important matter relating to our own specialties, to which alone our space has of late been far from adequate.—H. W.

OPINION OF THE PRESS.

The *Inventor and Manufacturer*, a scientific Journal, published in Chicago, says:

"The AMERICAN GAS-LIGHT JOURNAL AND CHEMICAL REPERTORY, is a fine sixteen page semi-monthly paper, devoted to illumination, heating, ventilation, sanitary improvements, general science, etc. It is ably conducted, and is now in its *Thirteenth Volume*. The chemical department of this publication is edited by Prof. Henry Wurtz, whose articles indicate his ability to fill his position as a chemist and scientist.

Answers to Correspondents.

M. S., of Mich.—The books you have are good treatises on the subject, and a careful perusal of them should make you pretey well acqnainted with tee art.

A. F. D., of Md.—We will attend to your request, although you may have to wait until a more favorable opportunity occurs.

E. R., of Balt.—Carbonic acid may be detected by passing a stream of gas through lime water, when it will be rendered turbid if any of this gas exists.

J. O. Ehrenwerth, in order to utilize pulverized coal or other fuel in blast furnaces, proposes to conduct the same, after sizing, by means of a peculiar apparatus, into the blast-pipe, close to the nozzles of the discharges. This would facilitate the regulation of the furnace; the formation of carbonic acid about the tuyères takes place more rapidly, carbonic oxide is formed higher above the tuyè; the reduction zone is therefore placed higher up in the furnace, and the per centage of silicon in the pig-iron decreases.

AMERICAN

Gas Screen Manufacturing Company.

TO GAS-LIGHT COMPANIES.

Your attention is respectfully called to the new and improved Patent GAS SCREEN, now being manufactured by the "American Gas Screen Manufacturing Company." under the patents granted to E. DUFFEE, and are pleased to submit the following points of their excellence and superiority over all other Screens now in use.

The Screen is made with an Oak Frame, interlaced with split rattan drawn through holes at regular intervals in the Frame and cross pieces, the edges of the frame being grooved to prevent abrasion.

The advantages of the Screen are:

1st. The large purifying surface, the construction of the Screen giving over three-fourths of the surface for the gas to penetrate the lime.

2nd. On account of the free passage of the gas through the screen the pressure is reduced, thereby preventing the accumulating of carbon on the retorts.

3rd. The saving of lime and labor, as the screens are not liable to clog, and are easily cleaned,

4th. Their cheapness and simplicity of construction.

5th. Their *durability*—they can be used longer than any other now used.

Testimonials.

EAST BOSTON, February 22, 1870.

Mr. E. DUFFEE—Dear Sir: We have used your Trays for the last five years in our works, and find them to last the longest, and give the best satisfaction of any we have ever used.

Respectfully yours,
WM. W. WEST, Sup't.

CHELSEA, July 20, 1870.

Mr. E. DUFFEE—Dear Sir: I have used your Purifying Trays for three years, with entire satisfaction to our company. For durability and cheapness I am convinced they are the best with which I am acquainted. By the increased purifying capacity of your Trays, it relieves the pressure on the retorts, and prevents the accumulation of carbon, and also saves lime and labor.

J. M. SOMER, Sup. Chelsea Gas Co.

DORCHESTER, March 8, 1870.

Mr. E. DUFFEE—Dear Sir: We have had your Gas Trays in constant use for almost one year and six months, and find them superior to any others we have ever used, both in point of economy and efficiency.

Truly yours,
W. B. BROOKS,
Agent Dorchester Gas-Light Co.

BANGOR, August 2, 1870.

EDWARD DUFFEE, ESQ.—Dear Sir: Yours of the 20th ult. is received. In regard to your Gas Trays I take pleasure in saying that they have been in use over two years and have given perfect satisfaction, and they are in good order at the present time; should have no hesitation in recommending them, believing they are the most durable and easiest kept in order of any with which I am acquainted.

Respectfully yours,
W. H. PERRY, Superintendent.

The following Gas Companies are now using the American Gas Screen Company's Screen:

Boston Gas-Light Co., Mass.
East Boston Gas-Light Co., Mass
Chelsea Gas-Light Co., Mass.
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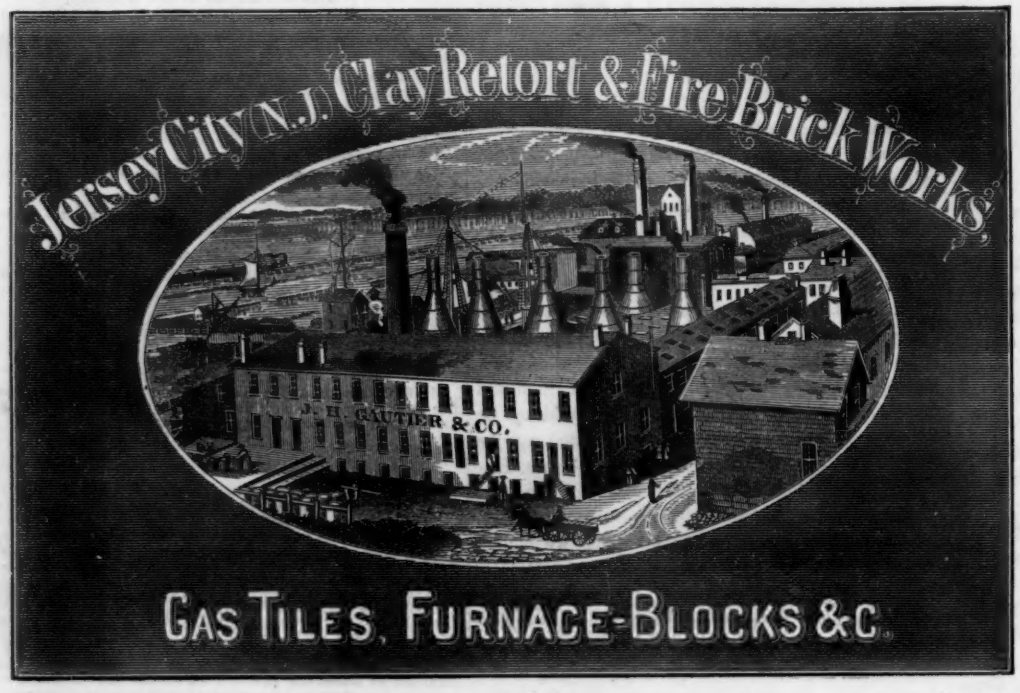

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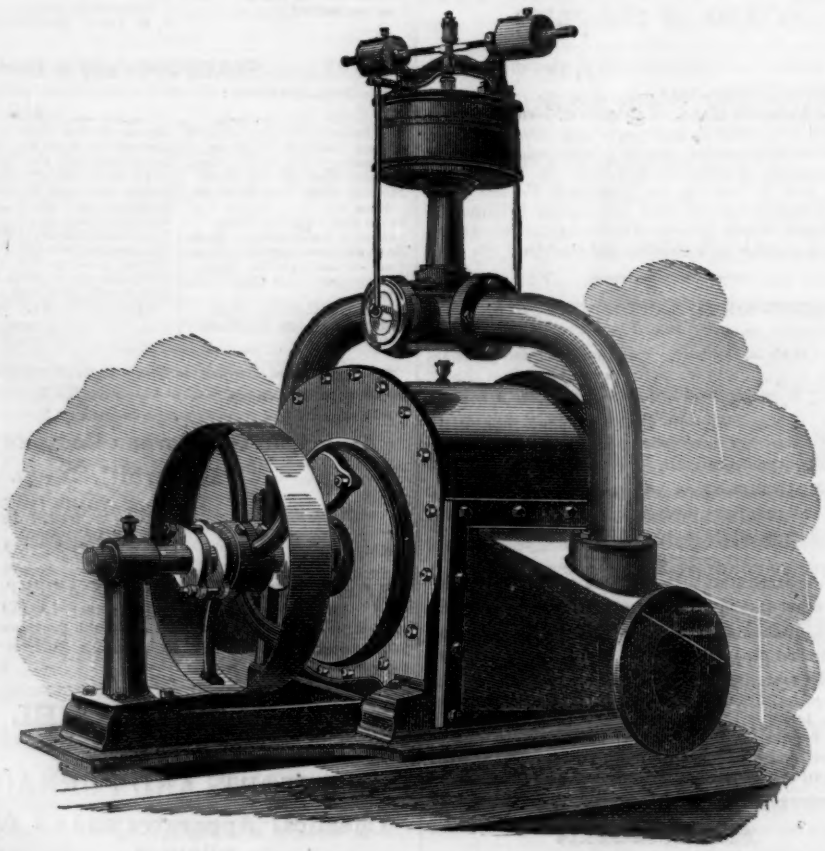

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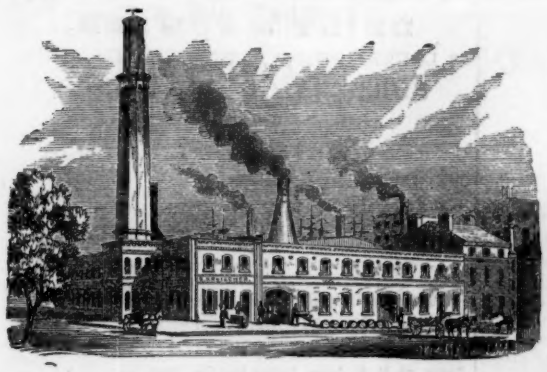

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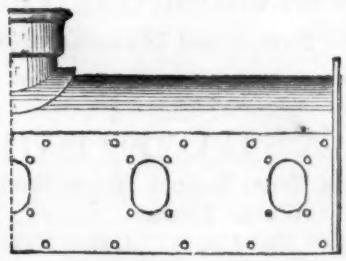

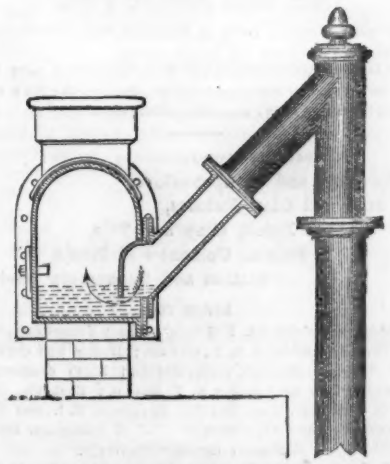

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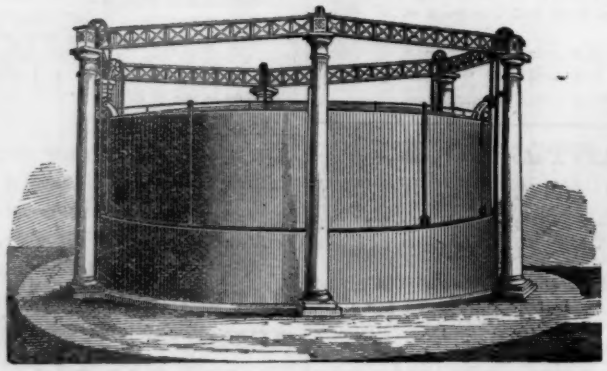

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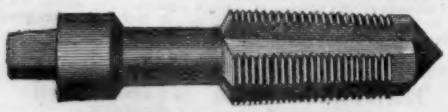

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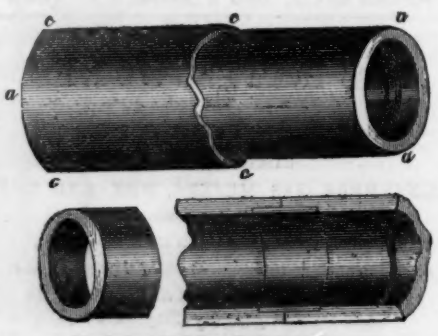

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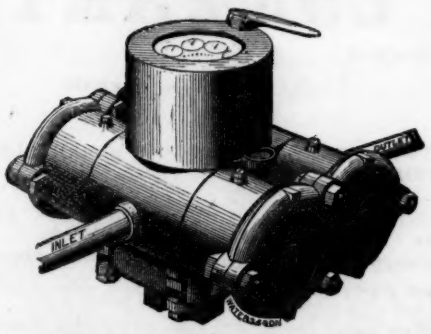

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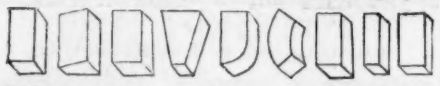

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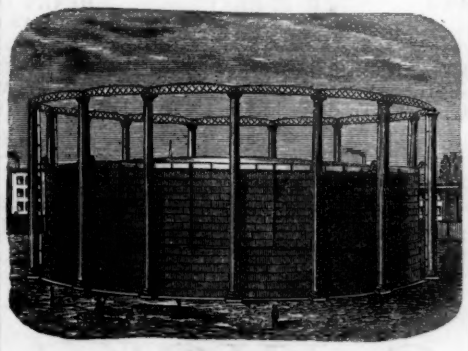

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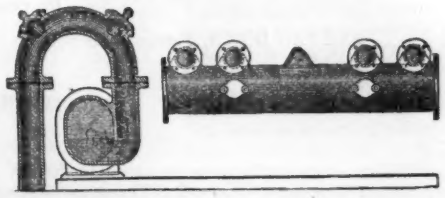

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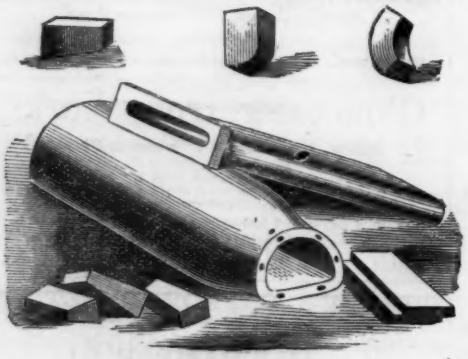

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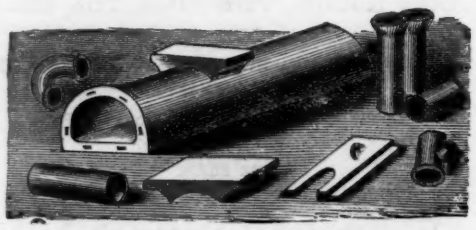

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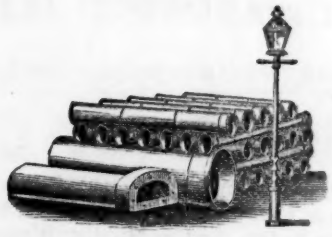

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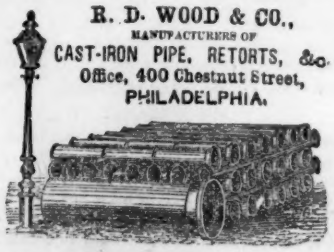

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